Data Communications Program

Overview

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By: Sandra Anderson
Program Manager, Data Communications

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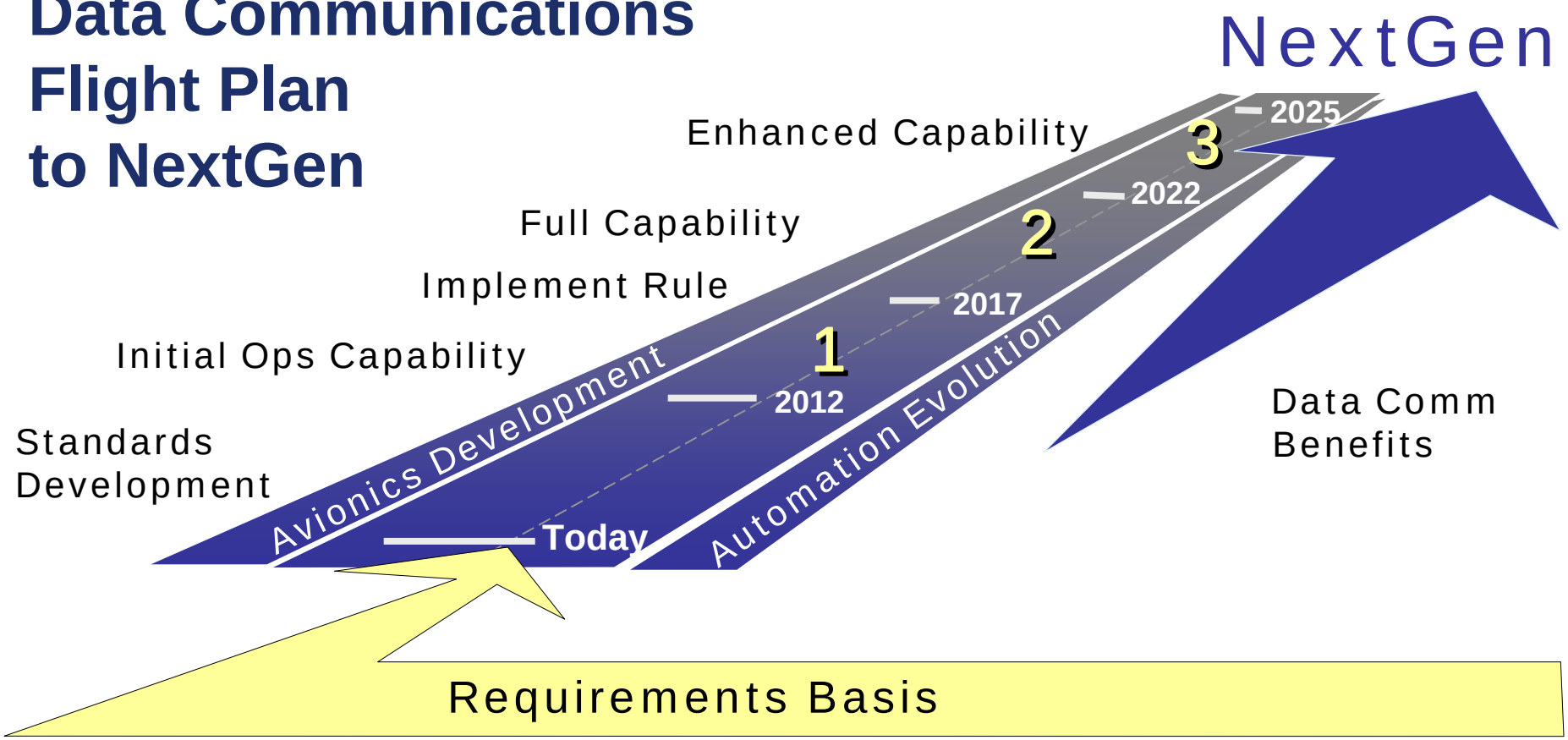
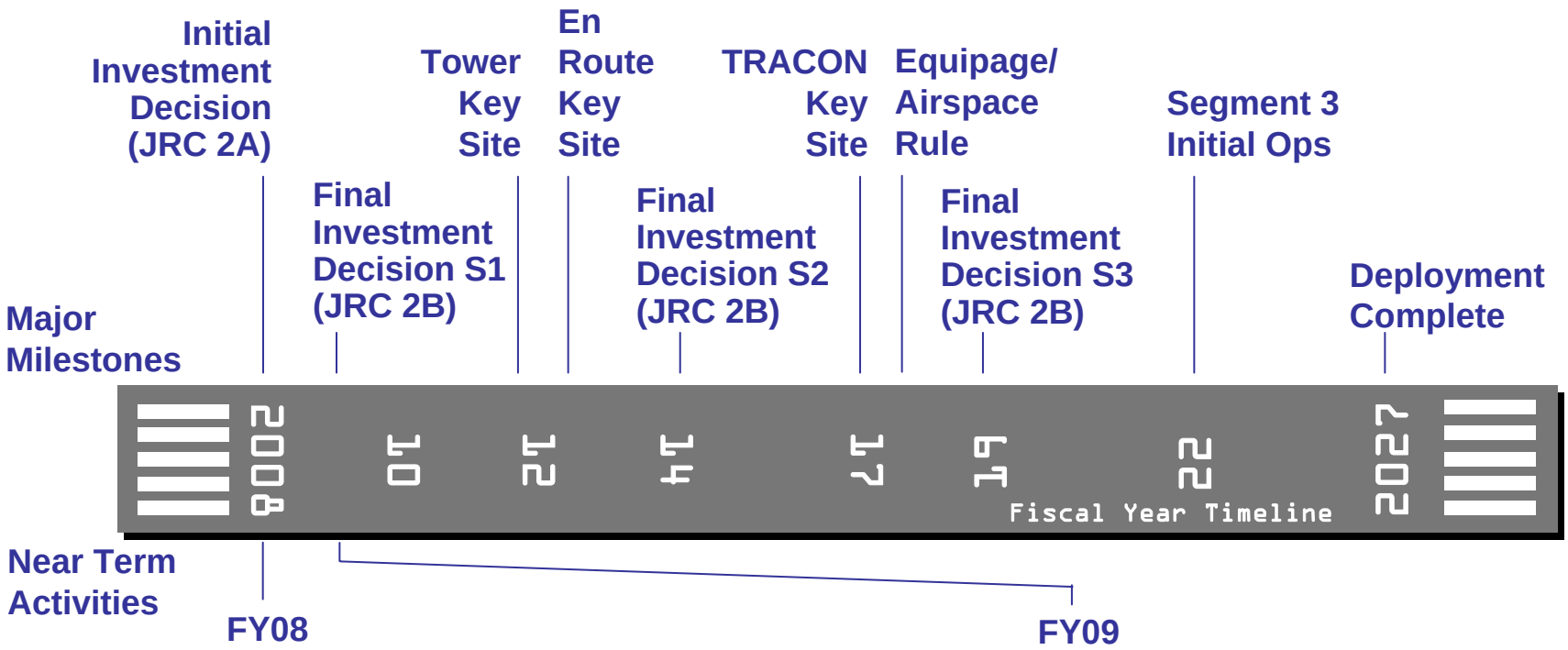
Data Communications Flight Plan to NextGen



ATMAC	JPDO	P- ATM	COCR	PARC	OEP
Letter to start a Data Comm Program	**NextGen Concept of Operations**	**Performance Based ATM concepts**	**Data Comm Services Menu**	**Datalink Roadmap and Rulemaking**	**Operational Evolution Plan**

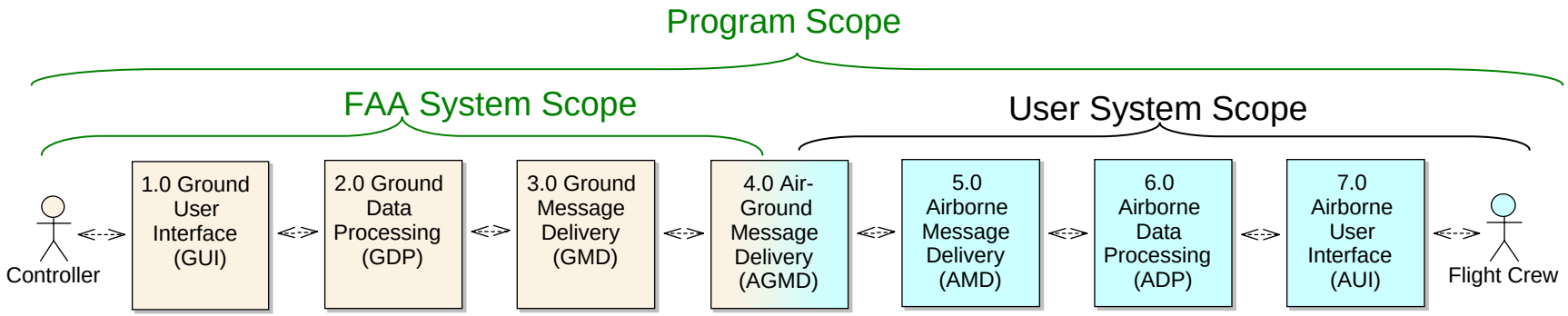
Data Communications Program Timeline



- Develop Data Communications Service Level Agreement(s)
- Develop interface requirements (e.g. ERAM, TFM, TDLS)
- Complete Safety Assessments
- Finalize Requirements Documents (inc Safety, Security)
- Develop Rulemaking Project Report
- Develop Screening Information Requests (SIR)
- Complete JRC 2A, Initial Investment Decision
- Release SIR(s)

- Receive and evaluate proposals
- Develop RPR 2 for NPRM
- Long-lead Segment 2 human factors and standards
- Finalize Business Case Analyses
- Complete JRC 2B, Final Investment Decision
- Award Data Comm enhancements to TDLS
- Award Data Comm enhancements to ERAM
- Award contract for air/ground communications

System Scope – Portfolio Approach



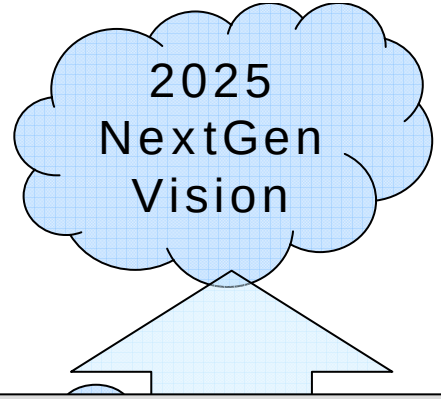
- **FAA System Scope**
  - Enhancements required to perform data communications in:
    - Ground User Interface (e.g. ERAM/DSR display software)
    - Ground Data Processing (e.g. application software to create clearances)
    - Ground Data Delivery (e.g. wide area networking between ground facilities)
    - A/G Message Delivery service or ground components (e.g. radio, ground antenna)
- **User System Scope**
  - Enhancements required to perform data communications in:
    - Airborne components of A/G Message Delivery (e.g. aircraft radio, antenna)
    - Airborne Message Delivery (e.g. aircraft networking)
    - Airborne Data Processing (e.g. app s/w in comm & flight management units)
    - Airborne User Interface (e.g. cockpit displays & s/w)

Subnetwork & Protocols

- **Per ATMAC guidance, subnet will be VDL-2**
  - May require additional 25kHz spectrum
  - Some prioritization/ground station handoff SW may be added to ground stations in later segments for load balancing
  - Mature NextGen may require new subnet which will be that investigated under Future Communications Study results

- **Application level protocols to be supported include:**
  - **Aeronautical Telecommunication Network (ATN)**
    - CPDLC (incl. Departure Clearance), Automatic Dependent Surveillance – Contract (ADS-C), Digital Automatic Terminal Information Service (D-ATIS)
  - **Future Air Navigation System (FANS)**
    - CPDLC & ADS-C (Departure Clearance support TBD)
  - **ARINC 623**
    - Departure Clearance & D-ATIS
  - **Plain Old ACARS** (POA)
    - Pre Departure Clearance (PDC) & D-ATIS
      - PDC users NOT eligible for revisions/full route clearances
      - POA sunset start of Segment Two

Data Communications Program Roadmap



Today | 2010 | 2015 | 2020 | 2025

Human – Human
Voice
Sector-Based Operations

Voice / Data
Performance-Based Operations

Automation – Automation
Data / Voice
Area-based Strategic Ops

Mandatory Equipage

Red = Terminal Function
Black = En Route Function
Purple = Cross Domain Function

Segment 1
- Initial 4-D Trajectory Mgmt for Arrivals to OEP's
- En Route Clearances, TFM Re-Routes & CTA
- Original +Revised Departure Clearances, D-ATIS & Taxi-Out

Segment 2
- Initial 4D Agreements
- Conformance Management
- TRACON Data Comm Clearances incl. 4-D CDA/TAP, CTA and Taxi-In
- Static Airport Map, NAS Status/Delays/Constraints

Segment 3
- Zero Visibility Taxi Guidance using Hi-Integrity Map
- Widespread Delegated Sep.
- Widespread 4D Agreements

• Standards Activities →

Segment 1 Functionality ~2012-2017

- **En Route based on ATN Baseline 1, PM CPDLC Level C (DO-280B) and FANS 1/A over VDL-2 (Same as LINK 2000+)**
  - Data communications initiation capability
  - Initial 4-D Trajectory clearances for tailored arrivals (FMS auto-load required). Available in select airspace as preferential ops, but airspace will remain mixed voice and data
  - Air Traffic Control Clearances including route changes (clearance info can be shared with other ground automations systems e.g., TFM)
  - Automated hand-off provides instructions for next sector frequency & data communications management
  - Free-text messages (e.g., Microphone Check to inform pilots of voice frequency blockage
  - Manual uplink of Controlled Time of Arrival from TFM

- **Tower based on ARINC 623 over VDL-2 and ATN Baseline 1, DCL (DO-280B) over VDL-2**
  - Data communications initiation capability
  - Air Traffic Control Clearances including departure clearance plus revisions, and departure taxi instructions (clearance info can be shared with other ground automations systems e.g., TFM)
  - Digital ATIS over FAA data infrastructure

Segment 2 Functionality ~2017-2022

- **En Route based on FMS-integrated ATN (DO-nnn) and FANS 1/A over VDL-2**
  - New/Additional ATC Clearances
  - Flight Path Intent (FMS predicted flight path for trajectory conformance monitoring)
  - Common Trajectory Coordination agreement in performance based airspace. Not expected that the entire route contained in initial agreement will be conflict free
  - Flight performance downlink (e.g. heading, speed, rate of climb) to controller & ground tracking system
  - Aircrew preferences downlink (e.g., preferred altitude for given weight/time) available to controller/TFM Automation
  - Automate the interface for uplink of Controlled Time of Arrival from TFM
  - NAS/Airport status, delays & constraints etc. uplinked to the aircrew
- **TRACON based on FMS-integrated ATN (DO-nnn) and FANS 1/A over VDL-2**
  - Add Data Comm functions for ATC Clearances including arrival taxi support
  - Automated hand-off provides instructions for next sector frequency & data communications management
  - Flight Path Intent (FMS predicted flight path for trajectory conformance monitoring)
  - Flight performance downlink (e.g., speed, selected altitude or approach)
  - Automate the interface for uplink of Controlled Time of Arrival from TFM
  - NAS/Airport status, delays & constraints etc. uplinked to the aircrew**)**
- **Tower based on ARINC 623 over VDL-2 and ATN Baseline 1 DCL (DO-280B) over VDL-2**
  - New ATC Clearances including detailed taxi instructions (in place of coded routes), RNAV Departure procedures & arrival taxi support
  - Aircrew preferences downlink
  - Uplink of static display of current airport map
  - NAS/Airport status, delays & constraints uplinked to the aircrew**)**

Challenges / Opportunities

- **Functional Allocation & System Integration**
  - En Route / TRACON / Tower / TFM + Ground Network + RF Link
- **Synchronization of Investments**
  - The right service sets, available at the right time at the right locations
  - User, supplier business cases
  - Avionics
  - Rulemaking
- **Acquisition of Services**
  - Bundling of functional elements
  - Lease, buy, build options
  - Key cost drivers